I claim:

1. A system for controlling the temperature and humidity level of a controlled space, the system comprising:

a) an air supplier adapted to supply air to the controlled space, creating a supply air steam;

b) an air exhauster adapted to exhaust air out of the controlled space, creating an exhaust air stream adjacent to the supply air stream;

c) a partition disposed between the supply and exhaust air streams that separates the supply and exhaust air streams;

d) a total energy recovery device in contact with the supply air stream and exhaust air stream that exchanges heat and moisture between the supply and exhaust air streams;

e) a dehumidification wheel positioned to rotate through the supply air stream and the exhaust air stream that exchanges heat and moisture between the supply and exhaust air streams; and

f) a cooler disposed in the supply air stream between the total energy recovery device and the dehumidification wheel, the cooler adapted to cool and dehumidify the supply air stream.

2. The system of claim 1 wherein the dehumidification wheel is a desiccant-based dehumidification wheel.

3. The system of claim 1 wherein the total energy recovery device is a desiccant-based total energy recovery device.

4. The system of claim 1 wherein the dehumidification wheel is a passive dehumidification wheel.

5. The system of claim 1 wherein the cooler comprises a cooling coil.

6. The system of claim 1 wherein the supply air stream comprises air supplied from outside the controlled space.

7. The system of claim 1 wherein the supply air stream comprises air supplied from inside the controlled space.

8. The system of claim 1 wherein the total energy recovery device is a total energy recovery wheel positioned to rotate through the partitioned supply air stream and exhaust air stream.

9. The system of claim 8 wherein the dehumidification wheel is a desiccant-based dehumidification wheel.

10. The system of claim 8 wherein the total energy recovery wheel is a desiccant-based total energy recovery wheel.

11. The system of claim 8 wherein the dehumidification wheel is a passive dehumidification wheel.

12. The system of claim 8 wherein the cooler comprises a cooling coil.

13. The system of claim 8 wherein the supply air stream comprises air supplied from outside the controlled space.

14. The system of claim 8 wherein the supply air stream comprises air supplied from inside the controlled space.

15. The system of claim 8 having a cooling/dehumidification mode wherein:

a) the total energy recovery wheel has a dry and cool zone and a moist and warm zone;

b) the total energy recovery wheel communicates with the air supplier such that the supply air steam is passed through the dry and cool zone of the total energy recovery wheel as it rotates through the supply air stream, thereby cooling and dehumidifying the supply air stream;

c) the total energy recovery wheel communicates with the air exhauster such that the exhaust air stream is passed through the moist and warm zone of the total energy recovery wheel as it rotates through the exhaust air stream, thereby cooling and drying the total energy recovery wheel;

d) the cooler communicates with the air supplier such that the supply air stream is passed through the cooler after leaving the total energy recovery wheel, thereby further cooling and dehumidifying the supply air stream;

e) the dehumidification wheel has a warm and dry zone and a cool and moist zone;

f) the dehumidification wheel communicates with the air supplier such that the supply air stream leaving the cooler is passed through the warm and dry zone of the dehumidification wheel as it rotates through the supply air stream, thereby warming and further dehumidifying the supply air stream; and

g) the dehumidification wheel communicates with the air exhauster such that the exhaust air stream is passed through the cool and moist zone of the dehumidification wheel as it rotates through the exhaust air stream, thereby warming and drying the dehumidification wheel.

16. The system of claim 8 wherein the dehumidification wheel rotates at a controlled speed, the system further comprising a speed controller for adjusting the rotational speed of the dehumidification wheel.

17. A method of operating the system of claim 16 wherein the rotational speed of the dehumidification wheel is adjusted so as to control the level of heat and moisture exchanged by the dehumidification wheel.

18. The system of claim 8 wherein the cooler has a controlled cooling output, the system further comprising a cooling controller for adjusting the cooling output of the cooler.

19. A method of operating the system of claim 18 wherein the cooling output of the cooler is adjusted so as to control the level of cooling or dehumidification provided by the cooler.

20. The system of claim 8 wherein the dehumidification wheel rotates at a controlled speed, the system further comprising a speed controller for adjusting the rotational speed of the dehumidification wheel, and wherein the cooler has a controlled cooling output, the system further comprising a cooling controller for adjusting the cooling output of the cooler.

21. A method of operating the system of claim 20 for cooling a controlled space without substantially adjusting the humidity of the controlled space, the method comprising the steps of:

a) increasing the cooling output of the cooler; and

b) reducing the rotational speed of the dehumidification wheel to a predetermined range within which the dehumidification wheel provides a reduced level of heating or no heating to the supply air stream.

22. A method of operating the system of claim 20 for cooling and dehumidifying a controlled space, the method comprising the steps of:

a) increasing the cooling output of the cooler; and

b) adjusting the rotational speed of the dehumidification wheel to a predetermined range within which the dehumidification wheel provides a reduced level of heating and an increased level of dehumidification to the supply air stream.

23. A method of operating the system of claim 20 for heating a controlled space without substantially adjusting the humidity of the controlled space, the method comprising the steps of:

a) reducing the output of the cooler such that delivered humidity content of the air entering the controlled space approximates that desired within the controlled space; and

b) increasing the rotational speed of the dehumidification wheel to a predetermined range within which the dehumidification wheel provides an increased level of heating and a decreased level of dehumidification to the supply air stream.

24. A method of operating the system of claim 20 for heating and dehumidifying a controlled space, the method comprising the steps of:

a) increasing the cooling output of the cooler such that the cooler dehumidifies the supply air entering the dehumidification wheel; and

b) adjusting the rotational speed of the dehumidification wheel to a predetermined range within which the dehumidification wheel provides an increased level of both heating and dehumidification to the supply air stream.

25. The system of claim 1 having a cooling/dehumidification mode wherein:

a) the total energy recovery device has a dry and cool zone and a moist and warm zone;

b) the total energy recovery device communicates with the air supplier such that the supply air steam is passed through the dry and cool zone of the total energy recovery device, thereby cooling and dehumidifying the supply air stream;

c) the total energy recovery device communicates with the air exhauster such that the exhaust air stream is passed through the moist and warm zone of the total energy recovery device, thereby cooling and drying the total energy recovery device;

d) the cooler communicates with the air supplier such that the supply air stream is passed through the cooler after leaving the total energy recovery device, thereby further cooling and dehumidifying the supply air stream;

e) the dehumidification wheel has a warm and dry zone and a cool and moist zone;

f) the dehumidification wheel communicates with the air supplier such that the supply air stream leaving the cooler is passed through the warm and dry zone of the dehumidification wheel as it rotates through the supply air stream, thereby warming and further dehumidifying the supply air stream; and

g) the dehumidification wheel communicates with the air exhauster such that the exhaust air stream is passed through the cool and moist zone of the dehumidification wheel as it rotates through the exhaust air stream, thereby warming and drying the dehumidification wheel.

26. The system of claim 1 wherein the dehumidification wheel rotates at a controlled speed, the system further comprising a speed controller for adjusting the rotational speed of the dehumidification wheel.

27. A method of operating the system of claim 26 wherein the rotational speed of the dehumidification wheel is adjusted so as to control the level of heat and moisture exchanged by the dehumidification wheel.

28. The system of claim 1 wherein the cooler has a controlled cooling output, the system further comprising a cooling controller for adjusting the cooling output of the cooler.

29. A method of operating the system of claim 28 wherein the cooling output of the cooler is adjusted so as to control the level of cooling or dehumidification provided by the cooler.

30. The system of claim 1 wherein the dehumidification wheel rotates at a controlled speed, the system further comprising a speed controller for adjusting the rotational speed of the dehumidification wheel, and wherein the cooler has a controlled cooling output, the system further comprising a cooling controller for adjusting the cooling output of the cooler.

31. A method of operating the system of claim 30 for cooling a controlled space without substantially adjusting the humidity of the controlled space, the method comprising the steps of:

a) increasing the cooling output of the cooler; and

b) reducing the rotational speed of the dehumidification wheel to a predetermined range within which the dehumidification wheel provides a reduced level of heating or no heating to the supply air stream.

32. A method of operating the system of claim 30 for cooling and dehumidifying a controlled space, the method comprising the steps of:

a) increasing the cooling output of the cooler; and

b) adjusting the rotational speed of the dehumidification wheel to a predetermined range within which the dehumidification wheel provides a reduced level of heating and an increased level of dehumidification to the supply air stream.

33. A method of operating the system of claim 30 for heating a controlled space without substantially adjusting the humidity of the controlled space, the method comprising the steps of:

a) reducing the output of the cooler such that delivered humidity content of the air entering the controlled space approximates that desired within the controlled space; and

b) increasing the rotational speed of the dehumidification wheel to a predetermined range within which the dehumidification wheel provides an increased level of heating and a decreased level of dehumidification to the supply air stream.

34. A method of operating the system of claim 30 for heating and dehumidifying a controlled space, the method comprising the steps of:

a) increasing the cooling output of the cooler such that the cooler dehumidifies the supply air entering the dehumidification wheel; and

b) adjusting the rotational speed of the dehumidification wheel to a predetermined range within which the dehumidification wheel provides an increased level of both heating and dehumidification to the supply air stream.

35. A system for controlling the temperature and humidity of a controlled space, the system comprising:

a) a supply fan adapted to supply air to the controlled space, creating a supply air steam;

b) an exhaust fan adapted to exhaust air out of the controlled space, creating an exhaust air stream adjacent to the supply air stream;

c) a partition disposed between the supply and exhaust air streams that separates the supply and exhaust air streams;

d) a desiccant-based total energy recovery wheel positioned to rotate through the partitioned supply air stream and exhaust air stream that exchanges heat and moisture between the supply and exhaust air streams;

e) a desiccant-based passive dehumidification wheel positioned to rotate through the supply air stream and the exhaust air stream that exchanges heat and moisture between the supply and exhaust air streams;

f) a speed controller for adjusting the rotational speed of the dehumidification wheel so as to control the level of heat and moisture exchanged by the dehumidification wheel;

g) a cooling coil disposed in the supply air stream between the total energy recovery wheel and the dehumidification wheel, the cooling coil adapted to cool and dehumidify the supply air stream; and

h) a cooling controller for adjusting the cooling output of the cooling coil so as to adjust the level of cooling and dehumidification provided by the cooling coil.

36. A system for controlling the temperature and humidity of a controlled space, the system comprising:

a) an air supplier adapted to supply air to the controlled space, creating a supply air steam;

b) an air exhauster adapted to exhaust air out of the controlled space, creating an exhaust air stream adjacent to the supply air stream;

c) a partition disposed between the supply and exhaust air streams that separates the supply and exhaust air streams;

d) a sensible energy recovery device in contact with the supply air stream and exhaust air stream that exchanges heat between the supply and exhaust air streams;

e) a dehumidification wheel positioned to rotate through the supply air stream and the exhaust air stream that exchanges heat and moisture between the supply and exhaust air streams; and

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f) a cooler disposed in the supply air stream between the total energy recovery wheel and the dehumidification wheel, the cooler adapted to cool and dehumidify the supply air stream.

37. A method of controlling the temperature and humidity of a controlled space, the method comprising the steps of:

a) supplying air to the controlled space and exhausting air from the controlled space, creating a supply air stream and an exhaust air stream;

b) providing a total energy recovery device having a dry and cool zone and a moist and warm zone, for cooling and dehumidifying the supply air stream;

c) cooling and dehumidifying the supply air stream by passing it through the dry and cool zone of the total energy recovery device;

d) cooling and drying the total energy recovery device by passing the exhaust air stream through the moist and warm zone of the total energy recovery device;

e) providing a cooler for further cooling and dehumidifying the supply air stream;

f) further cooling and dehumidifying the supply air stream by passing the supply air steam through the cooler;

g) providing a rotating dehumidification wheel for warming and further dehumidifying the supply air stream;

h) warming and further dehumidifying the supply air stream by passing the supply air stream through the warm and dry zone of the rotating dehumidification wheel; and

i) warming and drying the dehumidification wheel by passing the exhaust air stream through the dehumidification wheel.

38. The method of claim 37 wherein the dehumidification wheel is a passive dehumidification wheel.

39. The method of claim 37 wherein the dehumidification wheel is a desiccant-based dehumidification wheel.

40. The method of claim 37 wherein the total energy recovery device is a desiccant-based total energy recovery device.

41. The method of claim 37 further comprising the step of controlling the rotational speed of the dehumidification wheel to adjust the level of heating or dehumidification provided to the supply air stream.

42. The method of claim 37 further comprising the step of controlling the output of the cooler to adjust the level of cooling or dehumidification provided to the supply air stream.

43. The method of claim 37 further comprising the steps of controlling the rotational speed of the dehumidification wheel to adjust the level of heating or dehumidification provided to the supply air stream, and controlling the output of the cooler to adjust the level of cooling or dehumidification provided to the supply air stream.

44. A method of controlling the temperature and humidity of a controlled space, the method comprising the steps of:

a) supplying air to the controlled space and exhausting air from the controlled space, creating a supply air stream and an exhaust air stream;

b) providing a rotating total energy recovery wheel having a dry and cool zone and a moist and warm zone, for cooling and dehumidifying the supply air stream;

c) cooling and dehumidifying the supply air stream by passing it through the dry and cool zone of the rotating total energy recovery wheel;

d) cooling and drying the total energy recovery wheel by passing the exhaust air stream through the moist and warm zone of the rotating total energy recovery wheel;

e) providing a cooler for further cooling and dehumidifying the supply air stream;

f) further cooling and dehumidifying the supply air stream by passing the supply air steam through the cooler;

g) providing a rotating dehumidification wheel for warming and further dehumidifying the supply air stream;

h) warming and further dehumidifying the supply air stream by passing the supply air stream through the warm and dry zone of the rotating dehumidification wheel; and

i) warming and drying the dehumidification wheel by passing the exhaust air stream through the dehumidification wheel.

45. The method of claim 44 wherein the dehumidification wheel is a passive dehumidification wheel.

46. The method of claim 44 wherein the dehumidification wheel is a desiccant-based dehumidification wheel.

47. The method of claim 44 wherein the total energy recovery wheel is a desiccant-based total energy recovery wheel.

48. The method of claim 44 further comprising the step of controlling the rotational speed of the dehumidification wheel to adjust the level of heating or dehumidification provided to the supply air stream.

49. The method of claim 44 further comprising the step of controlling the output of the cooler to adjust the level of cooling or dehumidification provided to the supply air stream.

50. The method of claim 44 further comprising the steps of controlling the rotational speed of the dehumidification wheel to adjust the level of heating or dehumidification provided to the supply air stream, and controlling the output of the cooler to adjust the level of cooling or dehumidification provided to the supply air stream.

51. A method of controlling the temperature and humidity of a controlled space, the method comprising the steps of:

a) supplying air to the controlled space and exhausting air from the controlled space, creating a supply air stream and an exhaust air stream;

b) providing a rotating desiccant-based total energy recovery wheel having a dry and cool zone and a moist and warm zone, for cooling and dehumidifying the supply air stream;

c) cooling and dehumidifying the supply air stream by passing it through the dry and cool zone of the rotating total energy recovery wheel;

d) cooling and drying the total energy recovery wheel by passing the exhaust air stream through the moist and warm zone of the rotating total energy recovery wheel;

e) providing a cooling coil for further cooling and dehumidifying the supply air stream;

f) controlling the output of the cooling coil to adjust the level of cooling or dehumidification provided to the supply air stream;

g) further cooling and dehumidifying the supply air stream by passing the supply air steam through the cooling coil;

h) providing a rotating passive desiccant-based dehumidification wheel for warming and further dehumidifying the supply air stream;

i) controlling the rotational speed of the dehumidification wheel to adjust the level of heating or dehumidification provided to the supply air stream;

j) warming and further dehumidifying the supply air stream by passing the supply air stream through the warm and dry zone of the rotating dehumidification wheel; and

k) warming and drying the dehumidification wheel by passing the exhaust air stream through the dehumidification wheel.